Hawaii Agricultural Experiment Station

HONOLULU

J. G. SMITH, Special Agent in Charge.

PRESS BULLETIN NO. 18.

ALL ABOUT THE HAWAII EXPERIMENT STATION.

SOURCES OF MAINTENANCE.

The Hawaii Agricultural Experiment Station, organized in April, 1901, under the Office of Experiment Stations, U. S. Department of Agriculture, is supported by an annual appropriation of $15,000 from the Federal Treasury. The Legislature of Hawaii in 1904 voted an additional appropriation amounting to $228 per month. Congress has appropriated $5000 for a water system to be installed during the fiscal year 1907. Other sources of income are the receipts from the sale of products and occasional donations from private sources.

LOCATION.

The Hawaii Experiment Station is located on the Kewalo-Uka lands adjoining Honolulu. There are about 154 acres in the Station reservation, besides which the Station has the use of the twenty acre U. S. Naval Hospital Reservation. The land extends from Pensacola street, Honolulu, along the east slope of the Tantalus ridge to an elevation of 1350 feet above sea level. The office, library and laboratories are at the head of Pensacola street, within 300 yards of the Punahou electric car line.

FUNCTIONS OF THE STATION.

The function of the Hawaii Experiment Station is to investigate such agricultural problems in Hawaii as are for the benefit of this Territory. The general plan is to demonstrate by field experiments and laboratory investigations at the Station or elsewhere; by the introduction and distribution of seeds and plants; by the dissemination of information relative to agriculture, in printed form, by correspondence and by lectures; and, by the maintenance of the Farmers' Institute. The bulletins of the Station are distributed free to all residents of Hawaii on application. Thirty bulletins and five annual reports have been published up to October 1, 1906.

LINES OF WORK.

Project No. 1, General Outline. The investigations already begun are along the lines of field crops, chemistry, entomology and horticulture. In order that the people of Hawaii may know in regard to the definite lines of investigation now under way, the following special projects are outlined:

SPECIAL PROJECTS.

Project No. 2, Tobacco Investigations. Object: To determine the possibility of growing cigar leaf tobaccos in Hawaii.

The experiment has been under way three years. In 1906 four acres of tobacco were planted on Lot 17, Paauilo Homesteads, which was reserved from sale for the use of the Experiment Station by the Commissioner of Public Lands. A large modern curing barn with stringing and fermenting rooms has been constructed. The crop when harvested and cured will be sold in order to determine the market value of the product. The cost of this experiment is being borne out of the appropriation made by the Territorial Legislature for assistance to the Hawaii Experiment Station, and by contribution from private sources. The 1904 crop was small and was distributed among tobacco merchants in sample lots; none of this crop was sold. A portion of

the 1905 crop was sold to a Seattle cigar manufacturer, made up into cigars and then sent back to Hawaii. Preliminary estimates of the value of the 1906 crop are that there will be 3,000 pounds of wrapper leaf of high quality. The product of both Cuban and Sumatra types is of fine quality, superior in texture, burning qualities and aroma, to most of the mainland tobacco and comparable with that of the countries from which the seed was obtained. The Station will discontinue the demonstration whenever private enterprise takes up the cultivation of tobacco.

Project No. 3, Rubber Investigations. Object: To determine the influence which cultivation and the use of fertilizers may have on the yield and quality of commercial rubber.

Coöperative experiments have been planned in connection with one of the Nahiku rubber companies; also with the Territorial Board of Agriculture and Forestry in an investigation of the two old groves of Ceara rubber recently discovered on the island of Kauai. Pot experiments are being carried on at the Station to determine the influence of fertilizers on the growth of rubber trees, by the transpiration method. A beginning has also been made toward a collection of species of rubber yielding plants on the Station reservation.

Project No. 4, Coffee Investigations. Object: To assist and extend the cultivation of coffee in Hawaii.

Data have been secured relative to the methods of cultivation, planting, topping, shading, fermenting, curing and marketing coffee together with observations relative to the diseases and insect pests of the coffee plant. It is intended to publish a bulletin as soon as this work is completed.

Project No. 5, Plant Pathology. Object: To investigate the fungus diseases of cultivated crops other than sugar.

Experiments are under way in the treatment of diseases of pineapples, coffee, vanilla and tobacco. The publications already issued relating to this subject are Press Bulletins 3 and 9 and Bulletins 2, 7, 9 and 12. The special investigations of the present year are on the fungus which causes the rotting of ripe pineapples in transit to market.

Project No. 6, The Cultivation of Plants Yielding Tannin. Object: To demonstrate that the cultivation of tan bark trees is a profitable industry.

Six acres of black wattle located on the Experiment Station were cut down in 1905, the bark stripped, chopped, dried and sold, as was also the wood. A total return of $254.84 per acre was realized, indicating that mountain slopes too steep or rocky for utilization in any other way can be planted to the black wattle and other tan bark trees. Publications issued—Bulletin No. 11.

Project No. 7, The Composition of Hawaiian Feed Stuffs. Object: (1) To determine the chemical composition of Hawaiian fodders, principally those not grown or used for feed on the mainland. (2) To determine the ash ingredients of Hawaiian fodders. (3) To investigate the best means of supplying lime in a ration through the medium of the fodder alone without the addition of lime salts. (4) To supply data with which to carry on feeding experiments and a determination of digestion coefficients.

The chemical work is being done in the Station laboratory. Samples of fodders have been supplied by those interested in ranching and dairying in the Territory. The cost of this work is about $400 per annum. Publications, Bulletin No. 13, Press Bulletin No. 15.

Project No. 8, The Chemical Constitution of Nitrogenous Compounds in Hawaiian Soils. Object: (1) To determine more definitely than is now known, the chemical composition and constitution of the body or group of bodies known as humus. (2) To determine the identity and composition of organic nitrogenous bodies other than humus in Hawaiian soils. (3) To determine the degree to which bodies studied under 1 and 2 can be nitrified. (4) To determine whether any organic nitrogenous bodies present in Hawaiian soils are directly assimilated by plants.

The research investigations in connection with this work have been under way since 1904, and a bulletin on Hawaiian soil studies will be published this year. The cost of this work is about $1000 per annum.

Project No. 9, Dentrification in Hawaiian Soils. Object: To determine to what extent and under what conditions dentrification takes place in Hawaiian soils; to determine the form which the nitrogen takes as a result of this dentrification; and, the factors governing any variations in these forms.

This work has been under way two years at an expense to date of $200. The work will require about $1000 for its completion.

Project No. 10, The Composition of Hawaiian Honeys. Object: (1) To determine the chemical composition of Hawaiian honey and the variation due to the source. (2) To furnish data relative to the composition of honeys for the use of bee keepers selling the same on analysis. (3) To determine to what extent bees in Hawaii elaborate honey from materials other than the nectar of flowers, such as cane sugar, molasses, honey dew of leaf hoppers and other insects, and nectar from extra-floral nectaries. (4) To determine, if possible, the factors influencing granulation. (5) To determine the causes of abnormal ash composition.

This work has been under way for about one year under the joint auspices of the entomologist and chemist. A large series of samples have been secured from bee keepers throughout the Islands. The estimated cost of this work is about $1000.

Project No. 11, Manganese in Hawaiian Soils. Object: (1) To determine the form or forms in which manganese is present in such Hawaiian soils as contain manganese in large amounts. (2) To determine in such soils the amount, if any, of water soluble manganese. (3) To determine the relation, if any, of large amounts of manganese in the soil to the presence of ferrous iron. (4) To determine changes in form of combination and solubility in water, resulting from cultivation. (5) To determine the effect of small quantities of water soluble manganese naturally present in the soil on plant growth.

The observation was made early in 1906 by the station chemist that certain soils at Wahiawa, on Oahu, contain as much as 10% manganese, a small portion of which is. in some cases, water solu-

ble. The expenditure to date amounts to about $100 and the ultimate cost will be $1000.

Project No. 12, The Marketing of Tropical Fruits. Object: (1) To determine what Hawaiian fruits can be safely shipped to mainland markets. (2) To determine the best methods of gathering, packing and shipping tropical fruits. (3) To investigate the market conditions on the mainland in their relation to Hawaiian fruits and the possible extension of our trade.

The horticulturist has made large shipments of fruit to the mainland, himself accompanying one of these shipments, to secure information not obtainable by correspondence. The total cost to date amounts to about $1000, and $5000 will be required to carry the work to completion.

Project No. 13, Banana Cultivation. Object: To investigate cultural methods in relation to the banana crop in Hawaii and determine the most desirable varieties.

A fertilizer experiment is under way on grounds of the Hilo Boarding School at Hilo, and a collection of over forty varieties has been brought together at the Experiment Station in Honolulu. This Station coöperated with the Territorial Board of Agriculture in introducing, propagating and distributing a variety known as the Bluefield banana, suckers of which were obtained in 1904 from Costa Rica. Over 1000 suckers of this new variety have been distributed to applicants throughout the Territory. The cost of the work has been about $600 to date and will probably amount to $200 per annum.

Project No. 14, Cacao Cultivation. Object: To determine the adaptability of the cacao tree to Hawaiian conditions.

An experiment is under way on the grounds of the Hilo Boarding School at Hilo, Hawaii. Seeds have been obtained from Tutuila, Samoa, and a large number of plants have been received from the U. S. Department of Agriculture at Washington, comprising the best cultural varieties grown in the West Indies. About three acres of land have been prepared, planted with shade and are being planted with young cacao trees. The cost of this experiment will be about $200 per annum.

Project No. 15, Pineapple Investigations. Object: To investigate the cultivation of pineapples in Hawaii.

Work was commenced by the horticulturist in June, 1906, and a bulletin is in preparation. The cost of this investigation will be about $500.

Project No. 16, Rice Culture in Hawaii. Object: (1) To devise more thorough and cheaper methods of tillage than are now in vogue. (2) To compare the relative value of broadcast sowing and drilling with machinery with the expensive method of transplanting from seed beds as now practiced in Hawaii. (3) To study the duty of water in irrigation and the value of drainage in the culture of low-land rice. (4) To determine the adaptability of harvesting machinery to Hawaiian rice conditions. (5) To investigate methods of milling rice.

Experiments are now under way on a tract of land at the corner of King street and Kalakaua Avenue, Honolulu. The Station has purchased a rice binder, bog plow, disc cultivator and disc seeder, types of machinery used by rice growers on the mainland, and demonstrations will be made on a field scale. One hundred and ten named varieties of rice are being grown at the trial grounds. The cost of this experiment will be $3000 annually. The Bishop Estate, Ltd., and The Ii Estate, Ltd., have given financial assistance to the work.

Project No. 17, Rice Breeding. Object: (1) To improve existing varieties of Hawaiian rice. (2) To select and originate varieties which may prove more productive. (3) To develop a superior variety more tolerant to the brackish waters prevalent near the sea.

These investigations are being conducted at the same location as in Project No. 16.

Project No. 18, The Relation of Chemical Fertilizers to Hawaiian Rice Culture and a Study of Rotation of Crops. Object: To investigate the uses of chemical fertilizers in manuring rice, and experiments with crops which may be substituted for rice on swamp lands.

A series of pot experiments have been completed indicating the value of commercial fertilizers. These observations are about ready for publication.

Project No. 19, A Study of the Injurious Insects of Hawaii and Their Control. Object: To determine the injurious insects of Hawaii, their local occurrence, life cycle, habits, food plants, injury, and methods of control, including natural and active measures.

This line of work has cost about $9000 to date, and will cost about $2500 per annum. This work should be carried on as long as the Station is in existence. The publications are Bulletins Nos. 3, 5, 6 and 10; Press Bulletins Nos. 7, 10, 14, 16 and 17. A collection comprising the more important injurious insects of Hawaii has been made. A good working library of economic entomology is on hand and much valuable information has already been gained. Publications are in preparation on the insect enemies of the banana, mosquito control work in Hawaii, insect enemies of the citrus trees, insect enemies of coffee, insect enemies of garden vegetables, insects affecting forest trees, insects injurious to stored products, household insects, the melon fly, the horn fly and the Japanese rose beetle.

Project No. 20, The Use of Insecticides in Hawaii. Object: To determine the practical use of insecticides in the control of injurious insects, and determine the insecticides suitable for Hawaiian conditions, and the method of their application. The standard insecticides have been prepared and applied with apparatus purchased by the Station. This work is practically completed and has cost to date about $500. Publication, Bulletin No. 3.

Project No. 21, Mosquitoes in Hawaii and Their Control. Object: To determine the species of mosquitoes occurring in Hawaii, their distribution, breeding places, life cycle and habits. (2) To determine the extent and results, of attempts to control mosquitoes in Hawaii, the causes of their failure, the methods that will prove effective and the approximate cost of effective methods of control.

These investigations have cost to date about $2500 and will cost about $200 more. A Citizens' Committee campaign against mosquitoes was organized in Honolulu, and a complete demonstration made in coöperation with the Territorial Board of Health of the fact that any community can be freed from the mosquito nuisance if the proper measures are enforced. Publications, Bulletin No. 6, Press Bulletin No. 7, Reports 1904 and 1905.

Project No. 22, The Avocado Mealy-Bug. Object: To determine the distribution, food plants and extent of injury of the Avocado Mealy-Bug and to attempt its control by cultural methods and spraying.

Experiments were conducted, showing that this injurious insect can be easily controlled. The cost of the experiment was about $300 and has been completed. Publications, Press Bulletins Nos. 8 and 16.

Project No. 23, Introduction of Mosquito-Eating Fish. Object: To determine the species of fish that would become special enemies of the mosquito larvae, and attempt their introduction, distribution and establishment in natural breeding places.

A number of top minnows were collected in Texas and brought to Hawaii by an employee of the U. S. Fish Commission. They were propagated and distributed throughout the Islands by the Territorial Board of Health and the entomologist of this station. Wherever introduced they have propagated enormously. The cost of the experiment has been about $1700, $1500 of which was appropriated by the Territorial Legislature and expended under the supervision of the President of the Board of Health.

Project No. 24, The Sugar Cane Leaf-Hopper. Object: To investigate the life history, habits and extent of injury of the leaf-hopper affecting sugar cane and make suggestions as to measures for its control.

A detailed study of the life cycle of this insect was made in the insectary and field at the station in Honolulu. Infested cane fields of the Kohala, Hamakua and Waialua districts were visited and the insect studied in its relation to cane. Various active measures of control were attempted in cane fields and the con-

trol by cultural methods was given consideration. The work was completed in June, 1904, at a cost of about $750. Publication issued. Bulletin No. 5.

Project No. 25, Insect Enemies of Tobacco. Object: To determine the insect enemies of tobacco in Hawaii and the method of controlling them.

A collection of insects affecting tobacco was made and studied to determine their distribution and methods of control. This work was completed in June, 1905, at a cost of $400. Publication, Bulletin No. 10.

Project No. 26, Silk Culture in Hawaii. Object: To determine the race of silk worm best suited to local conditions, the quality of silk that can be produced and the possibility of the development of silk production as an industry.

Breeding experiments and investigations are under way at the station in Honolulu. Two crops of worms have been grown to maturity. The cocoons have been tested and the raw silk analyzed for comparison with the product of other silk producing countries. A crop of worms will be grown each year for demonstration purposes. Annual cost about $300, which must be continued for several years. Publication, Annual Report, 1905.

Project No. 27, Bee Keeping in Hawaii. Object: (1) To study bee keeping in Hawaii with a view to extension of the industry and improvement in races, and methods of apiculture suitable to the semi-tropical conditions of the islands. (2) To investigate the enemies and diseases of the honey bee and their control. (3) To determine the sources of Hawiian honey and the introduction of plants suitable for bee pasturage. (4) To determine the chemical composition of Hawaiian honey. (See project No. 10.)

Coöperative experiments are under way with the Garden Island Honey Co. in the introduction of improved strains of queens. The bee moth has been studied; together with a disease believed to be due to the shortage of pollen at certain seasons of the year, with a view to introducing plants which will flower dur-

ing these periods. The expense to date has been about $50. Publication, Annual Report, 1905.

Project No. 28, The Pineapple Scale. Object: To determine the distribution and injury due to the pineapple scale in Hawaii and the measures for its control.

Experiments have been made with insecticides and reports made to the owners of plantations. Work completed August 11, 1904, at a cost of about $200. Publication, Press Bulletin No. 10, two editions.

Project No. 29, Fuller's Rose Beetle. Object: To determine the distribution, food plants and injury due to the Japanese beetle in Hawaii and the measures for its control.

Investigations were made on the islands of Maui and Hawaii and the life-history was compiled from Station records. Work was completed Oct. 19, 1905, at a cost of about $100. Publication, Press Bulletin No. 14.

Project No. 30, The Mango Weevil. Object: To determine the life-history and habits of the recently introduced mango weevil, its local distribution, injury and the possibility of its control or extermination.

A study of the life-history of this insect was conducted in Honolulu. Work completed August 14, 1906, at a cost of about $500. Publication, Press Bulletin No. 17.

Project No. 31, Propagation of Mangoes. Object: To determine the methods of propagating mangoes in order to improve the quality of the fruit.

A large number of experiments have been carried on in budding and grafting mangoes and a collection of varieties is being assembled in order that cross-breeding and selection may be carried on. Cost to date about $500. Publication, Bulletin No. 12.

Project No. 32, The Avocado Pear. Object: To study the propagation, improvement, cultivation and marketing of the avocado or palto pear.

Experiments have been conducted at the Station with budding and grafting pears. The shipping qualities of the different vari-

eties are being determined. Studies of the behavior of the diffrent varieties of the fruit in cold storage have been made. An orchard is being planted on the station grounds to determine the cultivation methods and provide material for plant breeding. A bulletin is in preparation. Cost of work to date about $500.

Project No. 33, The Strawberry in Hawaii. Object: To investigate varieties suitable for Hawaiian conditions and determine the best methods of cultivation.

About 25 named varieties were grown at the Station in 1903 and an experiment was made to determine the effect of shading strawberry beds. Further experiments are under way. Cost to date about $200.

Project No. 34, The Wine Grape. Object: To determine the adaptability of the European Wine Grapes to Hawaiian conditions.

A collection of varieties were imported from California in 1902, from Australia in 1903, and from California in 1906. A coöperative experiment is being conducted with vineyardists on the Island of Maui. No definite results have been obtained. Cost of work to date about $200.

Project No. 35, The Testing of Miscellaneous Economics. Object: To investigate the possibility of introducing crops new to the Territory or of extending the cultivation of those now of only local importance.

A collection of economic plants propagated from seed or introduced from abroad is maintained in the station green houses and experimental plots. The cost of this branch of the work is about $700 per annum. No publications have been issued other than lists in the Annual Reports.

LIST OF PUBLICATIONS.

Bulletins Nos.

1. Chickens and Their Diseases in Hawaii.
2. The Root Rot of Taro.
3. Insecticides for Use in Hawaii (2 editions).

Bulletins Nos.

4. Sisal in Hawaii. (Out of print.)
5. A Sugar-cane Leaf-Hopper in Hawaii.
6. Mosquitoes in Hawaii.
7. The Banana in Hawaii.
8. Methods of Milking.
9. Citrus Fruits in Hawaii.
10. Insect Enemies of Tobacco in Hawaii.
11. The Black Wattle in Hawaii.
12. The Mango in Hawaii.
13. The Composition of Some Hawaiian Feeding Stuffs.
14. Hawaiian Soil Studies, No. 1 (in press).

Press Bulletins Nos.

1. The Function of the Experiment Station.
2. The Castor Bean.
3. Preliminary Experiments with the Quick Blight of the Potato.
4. A Resumé of Bulletin No. 2, in the Hawaiian Language.
5. Manila Hemp.
6. Vanilla. (Out of print.)
7. The Mosquito Poster; in English, Hawaiian, Chinese, Japanese and Portuguese. (Out of print.)
8. The Mealy-bug of the Alligator Pear. (Out of print.)
9. Two Plant Diseases in Hawaii: (a) The Pineapple Disease of Sugar-cane; (b) The Brown Eyed Disease of Coffee.
10. The Pineapple Scale (2 editions).
11. The Common Liver Fluke in Hawaii.
12. Tobacco Experiments in Hamakua, Hawaii.
13. Rubber in Hawaii.
14. Fuller's Rose Beetle.
15. Lime an Essential Factor in Forage.
16. The Avocado Mealy-bug.
17. The Mango Weevil.

Annual Reports 1901, 1902, 1903, 1904 and 1905.

Bulletins and Press Bulletins are issued in editions of 4000 copies. They will be distributed, free of charge, to anyone making application for the same.

STATION STAFF.

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JARED G. SMITH, *Director.*

Honolulu, T. H., October 10, 1906.